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(54) Filtering yeast slurry

(57) Yeast slurry is filtered in a diaphragm filter press, the resulting cake is squeezed by inflating the diaphragms, which are then deflated, and the cake is flushed from the press by circulating a fluid, which may be water or steam, through the chambers 16 of the press from inlet 54 to outlet 56. The cake removal may be assisted by reinflating the diaphragms. The fluid to remove the cake can initially be delivered through inlet 54, which is designed to feed the original slurry, or through the filter cloths in the reverse direction.

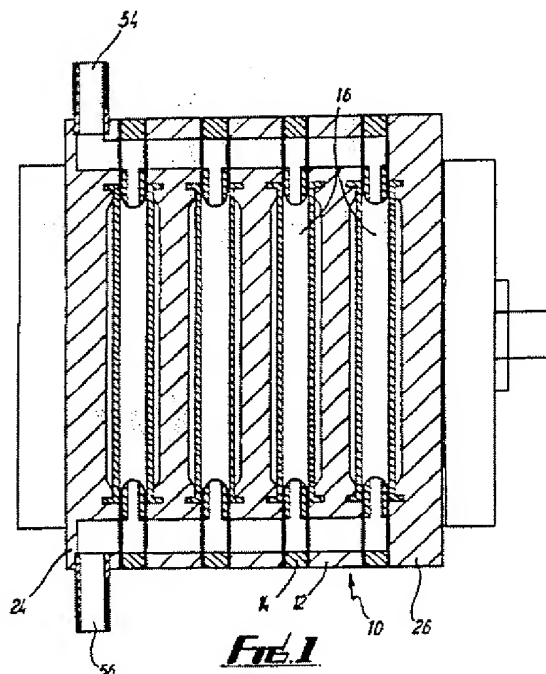


Fig. 1

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy

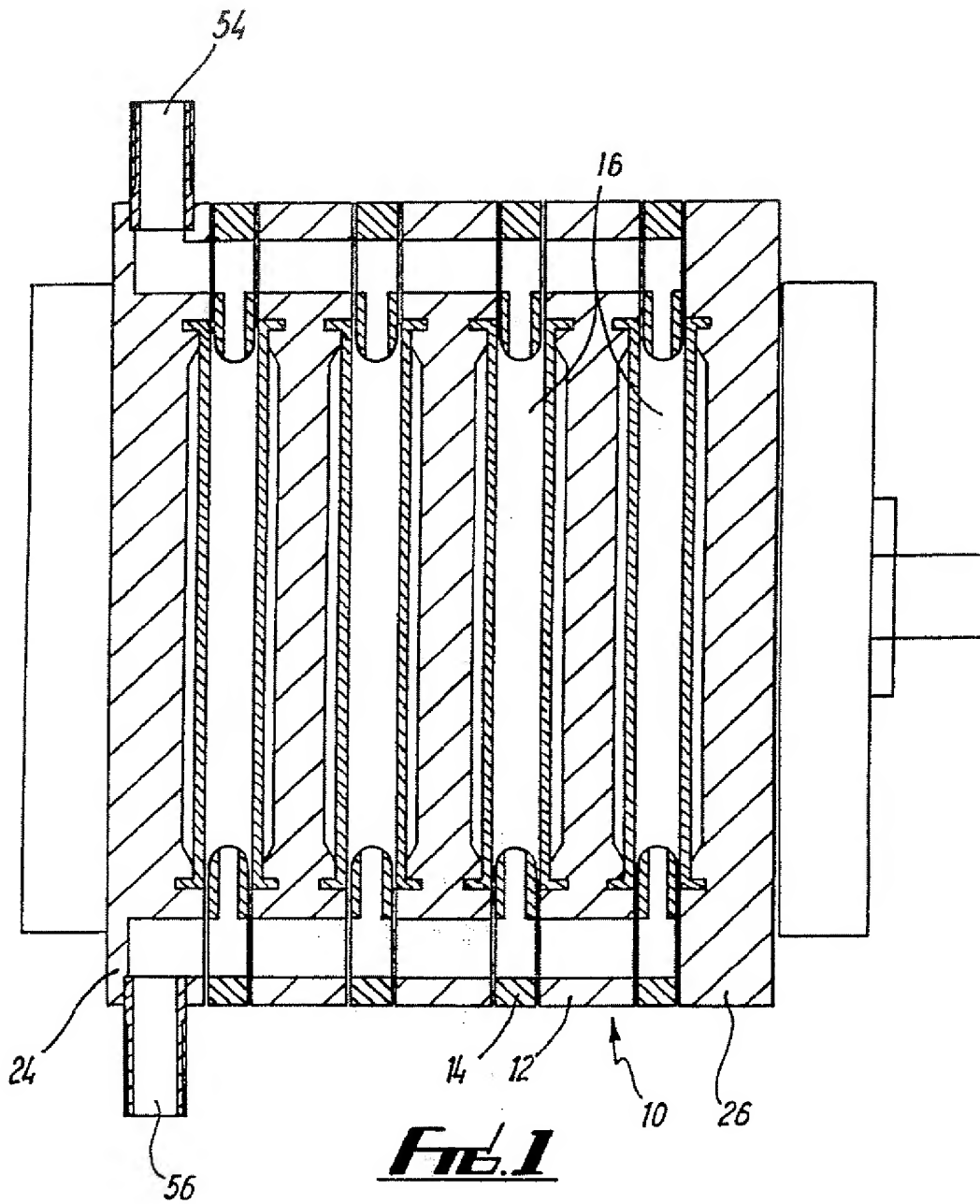


Fig. 1

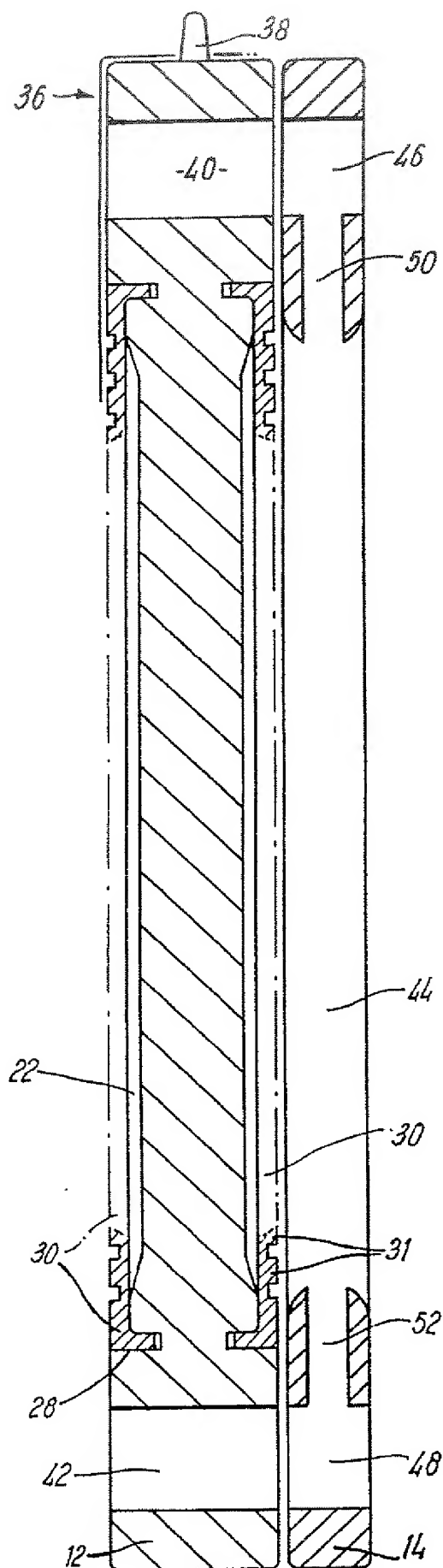


FIG. 2

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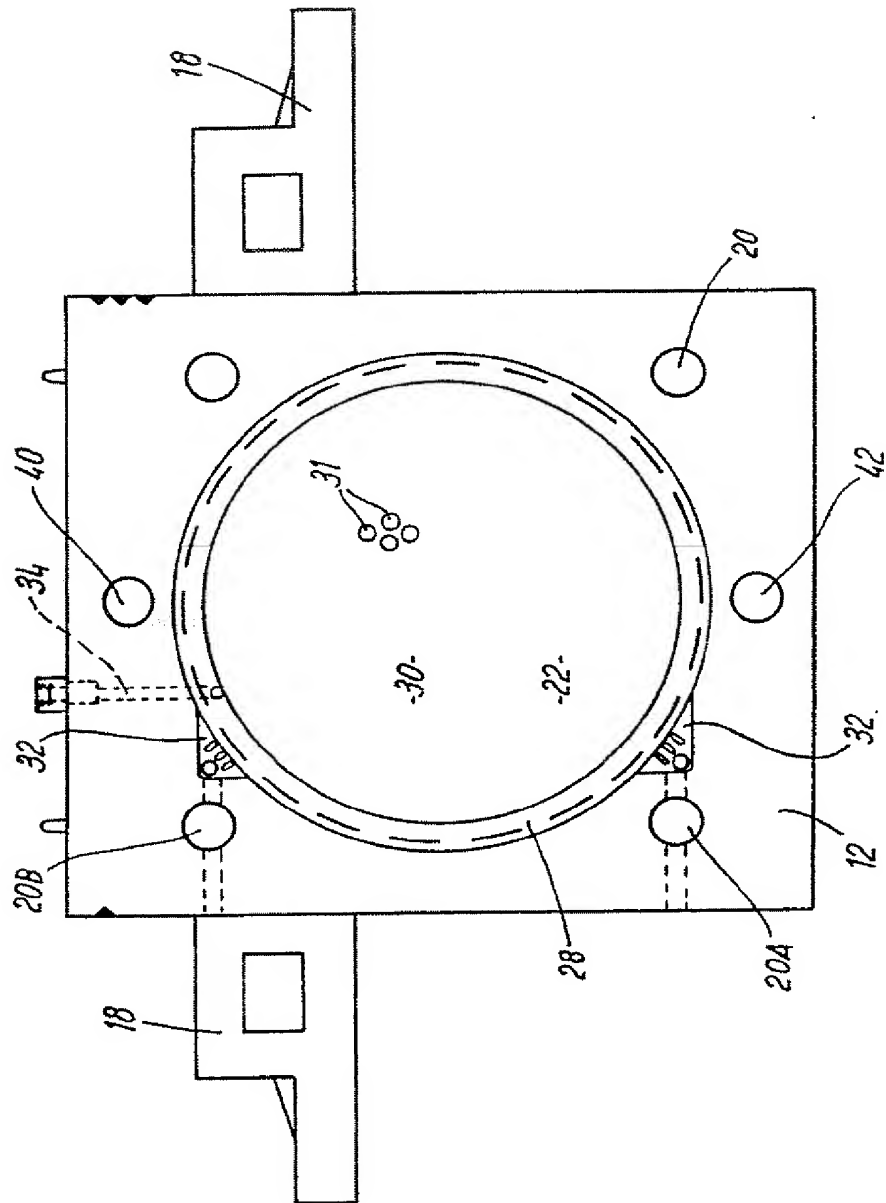


Fig. 3

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Improvements relating to Filtration

This invention concerns improvements in or relating to filtration and particularly but not exclusively to an improved method of filtration for use in the brewing industry and apparatus for carrying out such a method.

In applications such as the brewing industry sterility and the avoidance of contamination are particularly important. Conventionally standard filter presses are used when filtering yeast slurries subsequent to fermenting and maturation, and on slurries obtained from a centrifuge discharge, to obtain an increased yield of beer. When filtration is complete such presses require opening, i.e. separation of the plates, to enable removal of the cake. It is at this point that contamination can often occur. The cake obtained can be used in a number of different applications. On filter presses and particularly those in the brewing industry, diaphragms are often used to squeeze the filter cake after the conventional filtration process to recover additional liquid from the cake.

According to the present invention there is provided a method of filtration comprising filtering a slurry in a filter press and subsequently applying pressurised fluid to the cake thus formed to soften it and form a subsequent slurry, and when said slurry is

sufficiently fluent draining it from the press.

Preferably the subsequent slurry is recirculated through the press to ensure that all of the cake is carried therefrom.

The subsequent slurry is preferably urged from the press. In a diaphragm filter press the diaphragms are preferably used to urge the slurry from the press.

The pressurised fluid applied to the cake is preferably water and this may be heated and may be in the form of steam.

Also according to the present invention there is provided a method of filtration comprising introducing a slurry into a diaphragm filter press, such that the filtrate passes through the filter cloths, inflating the diaphragm to squeeze the filter cake thus formed to produce more filtrate, deflating the diaphragm, applying pressurised fluid to the cake to form a subsequent slurry and urging the subsequent slurry from the press by inflating the diaphragm.

Further according to the present invention there is provided a method of filtering a yeast slurry and

recovering the filter cake thus formed according to any of the preceeding five paragraphs.

Still further according to the present invention there is provided filtration apparatus for use with a method according to any of the preceeding six paragraphs.

According to a still further aspect of the present invention there is provided filtration apparatus comprising a plurality of filter plate assemblies, each assembly including a diaphragm, an inlet port for the slurry to be filtered, an outlet port for the liquid recovered, and an outlet port for the filter cake.

Preferably each assembly comprises a filter plate and a corresponding frame.

An embodiment of the present invention will now be described by way of example only with reference to the accompanying drawings in which:-

Fig 1 is a cross sectional side view of a filter press according to the present invention;

Fig 2 is a more detailed view of part of Fig 1; and

Fig 3 is a plan view of a filter plate of the press shown in Fig 1

The drawings show a filter press 10 suitable for filtering brewery yeast slurries. The press 10 comprises alternate filter plates 12 and frames 14 providing four chambers 16. The plates 12 and frames 14 all have side arms 18 (shown in Fig 3) which run along side rails (not shown).

Each plate 12 is of square outline and has a port 20 running through it adjacent each corner. A circular central recess 22 is provided on each side of the plates 12 except the end plates 24,26 which have only one such recess. At least one of the ports 20 connects with each recess 22 for discharge of the filtrate from the press. In the press 10 the recesses 22 on each plate 12 connect with the two ports on one side of the plate and the recesses 22 on adjacent plates connect with the two ports on the other side. The plate 12 shown in Fig 3 shows two ports 20A and 20B connecting with the recess 22.

A groove 28 is provided around the recess 22 which mounts the edge of a circular flexible diaphragm 30. Perforated tabs 32 are provided over the connections between the ports 20A and 20B and the recess 22 to permit

liquid to pass therethrough. The diaphragm 30 may be made, for example, from nitrile and has protrusions 31 on its face pointing away from the respective plate 12 defining flow channels thereover. Only a few of the protrusions 31 are shown on the drawing for clarity.

An air inlet 34 connects between the recess 22 and the top of the plate 12, and a screw thread is provided on its upper end for connection to a supply of pressurised air for inflation of the diaphragm 30. A filter cloth 36 is provided around the plate 12 fixed on the top thereof by pegs 38. Two further ports 40 and 42 are provided through the plate 12 not connecting with the recesses 22, located respectively towards the top and bottom of the plate 12.

The frames 14 are of similar square outline and have a central aperture 44 corresponding to the recess 22. Four ports (not shown) corresponding to the ports 20 are provided through the frame 14. Ports 46 and 48 corresponding respectively to the ports 40 and 42 and connected to the aperture 44 by respective passages 50, 52 are provided.

In use, slurry is pumped into the press 10 through an inlet pipe 54 connecting with the passages 50 via the

ports 40,46 into the chambers 16. The filtrate will pass through the filter cloths 36 into the ports 20. The diaphragms 30 are then inflated by air being blown through the inlet 34, squeezing the cake formed in the chamber 16 and releasing further filtrate into the ports 20.

When filtration is complete the diaphragms 30 are deflated. Water at a pressure of between 80 to 100 psi is then pumped in through the pipe 54 into the chambers to soften the filter cake. This water passes out through the passages 52 by the ports 48,42 to an outlet pipe 56 and is recirculated via the pipe 54 until all the cake is held in suspension in the slurry thus formed. The slurry is then discharged from the press with the aid of the diaphragms 30 being inflated to urge the slurry from the press.

There is thus described a method of filtration, and apparatus for carrying out this method which produces a number of advantageous effects. The need for the press to be opened after each filtration is obviated, the press only requiring opening for maintenance, inspection and routine cleaning. Accordingly the chances of contamination are considerably decreased. The amount of water used when cleaning between filtrations is

significantly reduced as compared with conventional methods. The amount of space required and particularly the necessary headroom, is reduced as spray heads above the plates may not be needed, and collection vessels for the cake below the plates will not be required. There is a saving in labour requirements as manual scraping and inspection of the plates after each filtration is not required. In the absence of this labour requirement the system can be fully automatically operated.

Various modifications may be made without departing from the scope of the invention. For example the pressurised water may be fed into the press through the ports 20 and then recirculated through the inlet 54 and outlet 56. A different number of plates and frames could be used, and the frames could be omitted if the plates were suitably modified. Different diaphragms could be used and these could be, for example, square. The high pressure water may be heated and may be in the form of steam.

Claims:

1. A method of filtration comprising filtering a slurry in a filter press and subsequently applying pressurised fluid to the cake thus formed to soften it and form a subsequent slurry, and when said slurry is sufficiently fluent draining it from the press.
2. A method of filtration comprising introducing a slurry into a diaphragm filter press, such that the filtrate passes through the filter cloths, inflating the diaphragm to squeeze the filter cake thus formed to produce more filtrate, deflating the diaphragm, applying pressurised fluid to the cake to form a subsequent slurry and urging the subsequent slurry from the press by inflating the diaphragm.
3. A method according to claim 1, in which the subsequent slurry is urged from the press.
4. A method according to any of the preceding claims, in which the subsequent slurry is recirculated through the press to ensure that all of the cake is carried therefrom.
5. A method according to any of the preceding claims, in which the pressurised fluid applied to the cake is

water.

6. A method according to any of the preceding claims, in which the pressurised fluid applied to the cake is heated.

7. A method according to claim 6 when dependent on claim 5, in which the pressurised fluid applied to the cake is in the form of steam.

8. A method of filtering a yeast slurry and recovering the filter cake thus formed according to any of the preceding claims.

9. Filtration apparatus for use with a method according to any of the preceding claims.

10. Filtration apparatus comprising a plurality of filter plate assemblies, each assembly including a diaphragm, an inlet port for the slurry to be filtered, an outlet port for the liquid recovered, and an outlet port for the filter cake.

11. Apparatus according to claim 10, in which each assembly comprises a filter plate and a corresponding frame.

12. A method of filtration substantially as hereinbefore described with reference to the accompanying drawings.

13. A method of filtering a yeast slurry and recovering the filter cake thus formed substantially as hereinbefore described with reference to the accompanying drawings.

14. Filtration apparatus substantially as hereinbefore described with reference to the accompanying drawings.

15. Any novel subject matter or combination including novel subject matter disclosed in the foregoing specification or claims and/or shown in the drawings, whether or not within the scope of or relating to the same invention as any of the preceding claims.